LA-UR-17-31152
Approved for public release; distribution is unlimited.

Title: PCSRI Goals

Author(s): Garrett, Charles Kristopher

Intended for: IC Final Report

Issued: 2017-12-11

PCSRI Goals

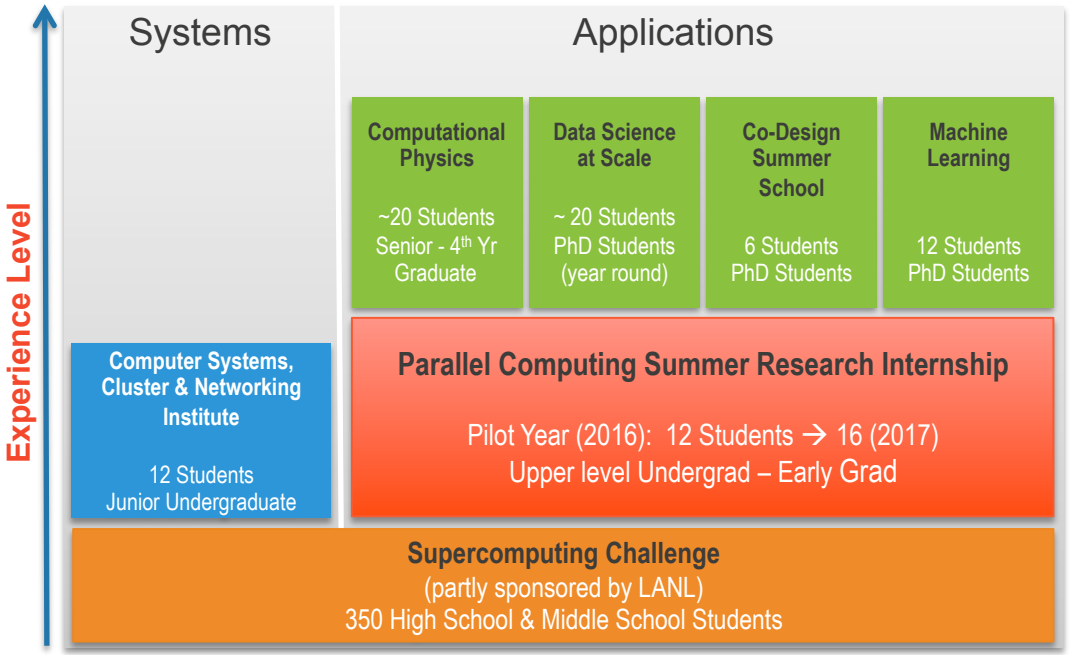


Figure 1: LANL HPC/Computing Student Pipeline by experience level and topic area.

- **TRAINING NEXT GENERATION**
  - Provide solid HPC education
  - Explore algorithms, methods and technologies based on architectural features
  - Instill good software development practices
- **DEVELOP COLLABORATION SKILLS**
  - Create a common language and break down barriers from science domain to hardware
- **ESTABLISH NEW PIPELINE FOR LANL & OTHER PROGRAMS**
  - Over half of staff historically have started in student programs

Needed NOW more than ever

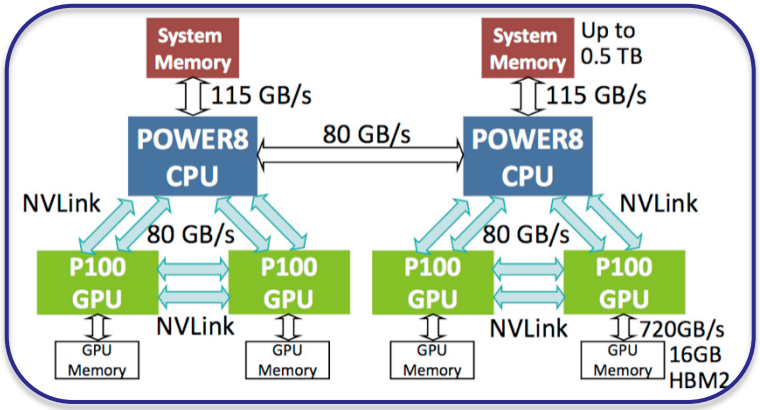
HPC is increasing in complexity

On-Node Parallelism

Affinity

In-Situ Visualization

CPUs + GPUs



Many-Core

EXASCALE

Asynchronous Task-Based

Memory Hierarchy

Performance Portability

Profiling

Schedulers – SLURM

Threading + Scoping

Vectorization

Compiler Bugs

Parallel Computing SRI

ISTI

NSEC National Security Education Center

Three Phases of PCSRI

Real-World Computing Resources

- Darwin in CCS @ LANL
  - KNL, Broadwell, Haswell, Sandybridge, GPUs, IBM Power8 + P100, etc.
- LANL Institutional Computing
  - Grizzly (Broadwell), Wolf (Sandybridge)
- LANL ASC Computing
  - Trinitite (Haswell + Knights Landing)
- NSF & NCSA
  - Bluewaters – Cray XE6 + XK7 (K20 GPU)
- NERSC
  - Cori (Intel Haswell + Knights Landing)

Compute-time allocations via proposal

Parallel Computing SRI | ISTI | NSEC National Security Education Center

Leadership/Organization: It Takes a Community

Co-Leads

Bob Robey
XCP-2

Hai Ah Nam
CCS-2

Kris Garrett
CCS-2

Joe Schoonover
CCS-2 (formerly)
VACANCY

Mentors

Neil Carlson (CCS-2)
Hai Ah Nam (CCS-2)
Garrett Kenyon (CCS-3)
Cristina Garcia Cardona (CCS-3)

Stefano Gandolfi (T-2)
Brendt Wohlberg (T-5)

Bob Robey (XCP-2)
Jesse Canfield (XCP-4)

Youzuo Lin (EES-17)
Eunmo Koo (EES-16)

Laura Monroe (HPC-DES)

Guest Lecturers

Bill Archer (ADX)
Galen Shipman (CCS-7)
Ryan Braithwaite (CCS-7)
Scott Pakin (CCS-7)
Rob Cunningham (HPC)
David Rogers (CCS-7)
Jennifer Estrada (ISR)
Ron Green (CCS-7)
Brendan Krueger (XCP-2)
KT Thompson (CCS-2)
Angela Herring (XCP-1)
Doug Jacobsen (Intel)
John Levesque (Cray)

Workshop Coordinator
Nickole Aguilar Garcia

ISTI Director – Stephan Eidenbenz

THANK YOU!

2017 Students: 16 Brave & Diverse Souls

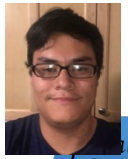
Robert Martin-Short
Geophysics, PhD
UC Berkeley

Alonso Navarro
Computational Science MS
San Diego State University

Justin Sunu
Computational Science PhD
SDSU/Claremont Graduate U

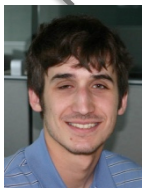
Jordan Fox
Computational Science PhD
SDSU/Claremont Graduate U

Kirtus Leyba
Astrophysics, BS+0
Arizona State University



Donald Kruse
Applied Math & CS, BS+0
UNM

Nils Carlson
Math & CS, BS
New Mexico Tech

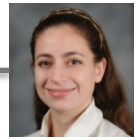


William Rosenberger
CS, BS+0
New Mexico Tech

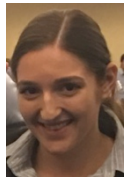
Siddhartha Bishnu
Physical Oceanograpy MS
Florida State University

Brian Kaiser
Physical Oceanography, PhD (MIT)

Prerna Patil
Fluid & Thermals Sciences, PhD
University of Pittsburgh



Rachel LeCover
Chemical Eng, PhD
Cornell University



Jennifer Soter
Physics, BS
Drew University

Jacob Carroll
Physics PhD
Virginia Tech

Trokon Johnson
Computer Eng, PhD
University of Florida

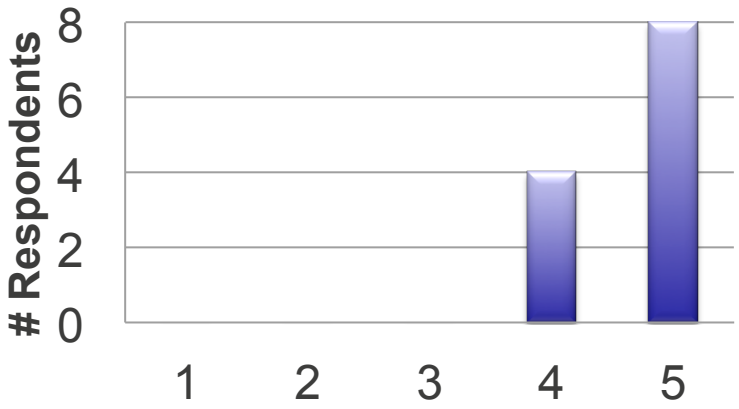
Parallel Computing SRI

ISTI

NSEC National Security Education Center

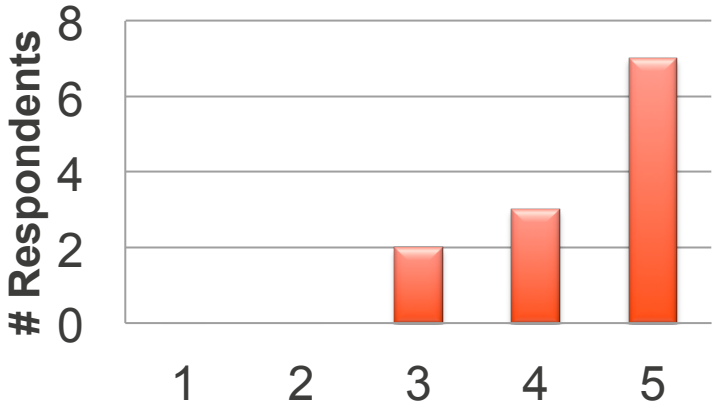
Retention

How would you rate this internship experience?
1 (eh, it was ok) to 5 (wow, I learned a lot)



- **Actively returning or engaged**
  - AML2018 – Sunu, Leyba, Carroll
  - Other internship – Kruse (quantum computing), Fox (neuromorphic), Soter (nuclear medicine), Johnson (USRC), Patil (CFD), Carlson (GPU)

Are you interested in returning to LANL (e.g. another internship, postdoc, future staff position)? 1 (not interested) to 5 (very interested)



- Looking for placement: Fogerty (9/2017), Navarro (12/2017), Bishnu (GRA)
- @ LANL: Rosenberger (A-1), Kaiser (XCP-4 continuation w/ Canfield), Carlson & Carroll (CCS-3 continuation w/ Kenyon)
- Unsure: Short (dissertation), LeCover (bio, kinetics)